electrolyte channel extending between the first port and at least one other port which is axially offset from the first port,

(c) simultaneously controlling the voltage applied to the three side channels, and optionally, at least one of said upstream and downstream channel end portions, to create a sample volume element in the electrolyte channel that has a desired leading- and trailing-edge shape and/or distribution of sample components within the volume element, and

G1 (d) simultaneously controlling the voltage applied to the upstream and downstream channel portion, and to at least two of the side channels, to advance the sample element having a desired leading- and trailing-edge shape and/or distribution of sample components in a downstream direction within the electrolyte channel.

G2 3. The method of claim 1, wherein the first port is axially aligned with the second port.

13. (Amended) A microfluidic system designed for use in injecting a defined-volume liquid sample into an electrolyte channel, for transport through the channel, comprising

a microfluidic device having a channel network that includes such an electrolyte channel having upstream and downstream channel portions and first, second, and third side channels that intersect the electrolyte channel between the two channel portions at first, second, and third ports, respectively, where at least one of the ports is axially spaced along the electrolyte channel from the other two ports,

G3

ports for supplying liquid medium to the electrolyte channel and the side channels,

upstream and downstream electrodes, and first, second, and third electrodes adapted to communicate with liquid medium contained in upstream and downstream portions of the electrolyte channel, and the first, second, and third side channels, respectively, and

a voltage controller operatively connected to the upstream downstream, and first, second, and third electrodes, which operates to

(a) apply across the first side channel and at least one of the other two side channels, a voltage potential effective to move a liquid sample contained in the first channel into a volume element of the electrolyte chamber extending between the first and at least one other port which is axially offset from the first port,

(b) simultaneously control the voltage applied to the three side channels, and at least one of said upstream and downstream channel end portions, to create a sample volume element in the electrolyte channel that has a desired leading- and trailing-edge shape and/or distribution of sample components within the volume elements, and

(c) simultaneously control the voltage applied to the upstream and downstream channel portion, and to at least two of the side channels, to advance the sample element having a desired leading- and trailing-edge shape and/or distribution of sample components in a downstream direction within the electrolyte channel.